The new update Princeton School of AI

Time Series Capstone Project: Whitepaper

ETF Price Prediction - Buy and Sell Signals

30 second pitch

Our AI model is designed to use 33 technical indicators to generate daily buy and sell signals 5 days in advance of market movement with approximately 70% accuracy.

- S&P 500 (SPY) ~ 67%
- Nasdaq 100 (QQQ) ~ 73%
- Russell 2000 (IWM) ~ 71%

Original Project summary

Objective: Build a startup company that utilizes an AI prediction model based on time series data.

The class decided to utilize financial market time series data for this project.

Business Plan Overview (Phase 1):

Use AI on historical time series data of various ETFs to predict the future direction of the investments. We will start with 3 well known ETFs to test the viability of our idea: SPY (S&P 500), QQQ (Nasdaq 100), and IWM (Russell 2000). While it is commonly believed that markets are efficient and that all known information is continually reflected in current stock prices, we will attempt to exploit inefficiencies and predict future prices using technical analysis and AI based on historical data. The output of the model will create Buy, Sell, Hold, or Short signals for each ETF. Our signals will come with a time period in which they must be executed (the next hour, minute, day, etc…).

Assuming positive backtested outcomes, we plan to go to market initially with a subscription based service targeted to individual investors and traders who are looking for an edge in timing the markets. Alternatively, we are considering targeting the tool to hedge funds, but this strategy may not align with MVP simplicity goal.

For the initial phase, the plan is to keep it “simple” and determine if there is any value to be added from modeling historic prices, their moving averages, and volume to predict future prices. Our MVP will be limited to the 3 ETFs listed here, but ideally the product will be able to take in any ETF as an input and produce signals for that ETF.

Model summary

One important trading signal that is popular is the moving (MA) crossover. This indicator helps traders spot impending changes in the price trend. When a short-term crosses above the long-term MA, it is said to be indicative of an uptrend. On the other hand, when a short-term crosses below the long-term MA, this signals a downtrend.

PrincetonPrediction developed a MA crossover model that anticipates trend changes in the coming days thus providing traders early signals for a "Buy", "Hold" or "Sell". This proprietary model was built utilizing long-short-term-memory (LSTM) deep learning techniques resulting to dramatic improvements in predictive accuracy.

A threshold of 0.1% was set to minimize false predictions. A "Buy" signal is picked up only by the model when it sees a larger crossover value than the threshold. It is a "Sell" signal when model sees a value below zero. Otherwise, the model calls it a "Hold' signal.

The data used in the model covered the daily ETF prices: (Open, High, Low, Close, Volume) along with a set of technical indicators (list provided below). Crossover is defined as ratio between the 14-day and 48-day
exponential moving averages (EMA). The choice to use EMA over simpler MA is it is weighted to the most recent data points and so is viewed to be more accurate.

Technical Analysis (TA) Indicators
https://technical-analysis-library-in-python.readthedocs.io/en/latest/

Volume

Accumulation/Distribution Index (ADI)
On-Balance Volume (OBV)
Chaikin Money Flow (CMF)
Force Index (FI)
Ease of Movement (EoM, EMV)
Volume-price Trend (VPT)
Negative Volume Index (NVI)
Volatility

Average True Range (ATR)
Bollinger Bands (BB)
Keltner Channel (KC)
Donchian Channel (DC)
Trend

Moving Average Convergence Divergence (MACD)
Average Directional Movement Index (ADX)
Vortex Indicator (VI)
Trix (TRIX)
Mass Index (MI)
Commodity Channel Index (CCI)
Detrended Price Oscillator (DPO)
KST Oscillator (KST)
Ichimoku Kinkō Hyō (Ichimoku)
Momentum

Money Flow Index (MFI)
Relative Strength Index (RSI)
True strength index (TSI)
Ultimate Oscillator (UO)
Stochastic Oscillator (SR)
Williams %R (WR)
Awesome Oscillator (AO)
Others

Daily Return (DR)
Daily Log Return (DLR)
Cumulative Return (CR)

Results

Discuss results.

Profiles

Please put your 2-3 sentence bio here.

About Princeton School of AI

We are the Princeton based chapter of The School of AI! whose mission is to offer a world-class AI education to anyone on Earth for free. Our doors are open to all those who wish to learn. This learning community spans almost every country and is dedicated to teaching our students how to make a positive impact in the world using AI technology - whether that's through employment or entrepreneurship.

Our chapter is comprised of AI enthusiasts from a wide range of interests and professions coming together to explore and learn how the power of AI can provide deeper perspectives and knowledge from the vast disparate data all around us.